For the reasons given in the Official Action, mailed November 21, 1995, made final, in parent application Serial No. 08/333,929, claims 1, 2, and 7-25 were rejected under 35 U.S.C. 103 over the disclosure of the Sifniades et al U.S. Patent No. 4,358,618 in combination with the disclosure of the Anderson et al U.S. Patent No. 4,207,264 and the disclosure of the Barilli British Patent No. 1,202,687. However, this rejection should not be repeated in the present application.

In the remarks which follow, a separate discussion is provided for (1) claims 1, 2, 7 and 8; and (2) claims 9-25.

I. THE REJECTION OF CLAIMS 1, 2, 7 AND 8

Novel and nonobvious features of the present claims 1, 2, 7 and 8 are the addition of acetone to the reactor of step (a), wherein the following occur: (1) dimethylphenyl carbinol (DMPC) is added to the reactor as an unavoidable by-product from the cumene oxidation reaction; (2) the reaction takes place at a temperature of from about 50°C to about 90°C; (3) the product from the reactor contains about 0.2 to about 3.0 weight percent cumene hydroperoxide (CHP); and (4) at least a portion of DMPC is converted to dicumyl peroxide (DCP) in the reactor.[1]

The combined teachings of the publications applied in the

---

[1] For convenience, attached hereto is a list of chemical formulae corresponding to compounds referred to herein, such as DMPC, CHP and DCP.

rejection do not suggest this particular combination of features.

The Barilli patent teaches that acetone may be added to a single stage reactor operated at 70°C or less to minimize the formation of cumylphenols and compounds of a pitchy character. As pointed out in the Examples, these cumylphenols and compounds of a pitchy character are obtained in the residue of the distillation of the reactor contents after the reaction is complete. The cumylphenols and pitch are, thus, the compounds having a boiling point higher than the unreacted cumene and useful products (i.e. acetone, phenol and alpha-methylstyrene) removed by distillation. As pointed out in the Zakoshansky U.S. Patent No. 5,254,751 (of record) at column 8, lines 25-27, these heavy by-products are collectively known as phenol tar and comprise acetophenone (AP), dimethyl phenyl carbinol (DMPC)[2], dicumyl peroxide (DCP), alpha-methyl styrene dimer (AMS dimer) and cumylphenol (CP).

The Barilli patent teaches that all of the following factors must be controlled in order to inhibit by-product formation during the decomposition of cumene hydroperoxide (CHP): (1) the temperature must be maintained at less than 70°C until the yield of phenol and acetone is maximized; (2) the concentration of sulfuric acid must fall within a limited range; and (3) the product discharged from the reactor must contain 37 to 48 wt % acetone.

---

[2] Referred to as dimethyl benzyl alcohol (DMBC) in the Zakoshansky patent.

The stated purpose for strict adherence to these criteria is to prevent condensing and dehydration reactions. See page 1, lines 30-35; and page 2, lines 13-20 and 31-35. This teaching is equivalent to teaching that any dimethyl phenyl carbinol (DMPC) included as an impurity in the feed is to remain essentially unconverted during the reaction.

It is a stated goal to convert DMPC in the reaction of the Sifniades et al patent, and at least a portion of the reaction is to be conducted at temperatures well in excess of 70°C. Accordingly, the Barilli patent and the Sifniades et al patent teach in opposite directions, and it is not obvious to combine these diametrically opposed teachings and arrive at embodiment within the scope of the present claims.

DMPC, when present with CHP, can only be converted by dehydration or condensation reactions. These reactions include the following:

$$\text{DMPC} \longrightarrow \text{AMS} + H_2O \qquad \text{(I)}$$

$$\text{DMPC} + \text{CHP} \longrightarrow \text{DCP} + H_2O \qquad \text{(II)}$$

Accordingly, by restricting the reaction (I), the formation of AMS is directly restricted, and by restricting the reaction (II) the formation of AMS is further restricted by preventing the initial step of the following sequence of reactions:

$$\text{DMPC} + \text{CHP} \longrightarrow \text{DCP} + H_2O \qquad \text{(II)}$$

DCP -----> Phenol + Acetone + AMS (III)

By restricting the formation of AMS, the formation of the unwanted by-products, cumylphenol and AMS dimers, is also prevented according to the following reactions:

AMS + Phenol -----> Cumylphenol (IV)

AMS + AMS ------> AMS dimer (V)

Accordingly, the Barilli patent teaches that the root cause of by-product formation should be completely cut off at the source by preventing the formation of AMS via condensation and dehydration reactions. In order to accomplish this result it is taught to be necessary, inter alia, to both (1) keep the temperature below 70°C at all times when reactants are in the presence of sulfuric acid[3] and (2) maintain 37 to 48 wt % acetone in the product discharge.

The teachings of the Sifniades et al patent are contrary to those of the Barilli patent in the following three respects: (1) at least a part of the reaction is to take place in the presence of sulfuric acid at temperatures well in excess of 70°C; (2) condensation reactions of DMPC to DCP are to be promoted to maximize the formation of AMS; and (3) the concentration of sulfuric acid in the reactor of the Barilli patent far exceeds the concentration of sulfuric acid in the reactor in the Sifniades et

---

[3] As pointed out *infra* the concentration of sulfuric acid in the reaction mixture of the Barilli patent is much greater than the concentration of the sulfuric acid in the Sifniades et al patent.

al patent.

Regarding the sulfuric acid concentration in the respective reactors, the Barilli patent broadly states that the sulfuric acid content of the reactor may range from 0.05 to 1.0 weight % (i.e. 500 to 10,000 ppm. See page 1, lines 45-55. In the Examples, 0.15 weight % (i.e. 1,500 ppm) of sulfuric acid is used. See page 2, lines 53, 84 and 96. On the other hand, the Sifniades et al patent states that between 30 and 400 ppm of acid may be used (see column 4, lines 11-12), but in Examples 9-11 and 13-17 only 50 ppm of sulfuric acid is used. See Table III on column 7, line 38 and column 7, line 56.

It is not obvious to combine the teachings of the Sifniades et al patent, which require promotion of condensation and dehydration reactions, with the teachings of the Barilli patent, which require suppression of condensation and dehydration reactions. There is clearly no suggestion from the combined teachings of these patents that AMS yields can be enhanced by including excess acetone in the first reactor of the Sifniades et al patent.

The Anderson et al patent fails to make up for the deficiencies of the other patents in suggesting embodiments of the present claims.[4] The Anderson et al patent merely suggests that

---

[4] Insofar as the Board decision, mailed March 18, 1992, (Paper No. 16) in the grandparent application (Serial No. 08/297,333), failed to address this patent, the disclosure of the Anderson et al patent is considered to be no longer relied upon. If the Examiner

when shell and tube reactors are used promote decomposition of certain aralkyl hydroperoxides, such as diisopropylbenzene hydroperoxides, the hydroperoxides should be introduced along with a solvent in a diluted form to prevent a run away exothermic reaction. In the reactor of the Anderson et al patent, there is a gradient of concentration as the reactants pass from the point of introduction to the point of exit, wherein the concentration of the reactants is highest near the point of introduction and lowest at the point of exit. The problem faced in this patent is not presented in the initial back-mixing reactor in Sifniades et al patent, wherein the concentration of the reactants is more homogeneous and hydroperoxide reactant is introduced into a reactor which already has considerable diluents in the form of products (e.g., phenol and acetone). The combined teachings of the Anderson et al patent and the Barilli patent would lead one away from adding excess acetone to the reactor of the Sifniades et al patent for fear of suppressing the formation of AMS. There is clearly no suggestion in the Anderson et al patent, whether viewed singly or in combination with the other patents, that the addition of excess acetone to the first reactor of the Sifniades et al patent would enhance the ultimate formation of AMS.

In a decision (Paper No. 16), mailed March 18, 1992, by the

---

disagrees, clarification of this matter is requested.

Board of Patent Appeals and Interferences in the grandparent application (SN 08/297,333), the data in applicants' specification is said to provide insufficient evidence of unexpected enhanced AMS formation.[5] Furthermore, the following is stated in the final rejection:

> "Applicants have not submitted evidence to overcome the rejection of record which was affirmed by the Board of Appeals."

In order to obviate this rejection, applicants submit for the Examiner's consideration further evidence, published subsequent to this decision, independently corroborating applicants' showing of unexpected results. More particularly, such evidence is provided in the Zakoshansky U.S. Patent No. 5,254,751, of record, issued October 19, 1993. Note, for example, column 2, lines 16-21, wherein it is stated:

> "In particular it has been found in the initial reaction wherein CHP is decomposed into phenol and acetone and DCP is made from the reaction of CHP and DMBA that the addition of recycle acetone as well as cumene has a particularly beneficial effect."

Note also column 4, lines 38-48 of this patent, as well as Table 3 on column 9.

---

[5] Issue is taken with this decision.

Accordingly, applicants' data, particularly when viewed in the light of the additional independently published data provided in the Zakoshansky patent, are sufficient to establish the unexpected advantages of the process as presently claimed in claims 1, 2, 7 and 8.

II. THE REJECTION OF CLAIMS 9-25

Claims 9-25 were copied from the Zakoshansky patent. Accordingly, the Patent and Trademark Office has already determined that these claims are patentable to Zakoshansky.

In the Official Action, the rejection of these claims is said to be made for reasons of record. However, referring to the above-mentioned decision of the Board, the reasons of record pertain only to the disclosures of the Sifniades et al and Barilli patent.[6] It will be noted that the Sifniades et al and Barilli patents are specifically of record on the face of the Zakoshansky patent. Therefore, the Patent and Trademark Office has already determined that the subject matter of the present claims 9-25 is patentable over the disclosures of the Sifniades et al and Barilli patents.

In the Official Action, it is stated:

"The newly submitted claims are broader in scope that the original claims which were found not allowable by the Board of Appeals."

---

[6] The Anderson et al patent is not discussed in this decision.

However, issue is taken with this statement.

The newly submitted claims are clearly of different scope than the claims subject to the above-mentioned Board decision. For example, newly submitted claim 9 calls for the reaction to take place in a non-isothermal manner. Also, new claims 15 and 20 are directed to a composition of matter, whereas claims 1, 2, 7 and 8 are directed to a process. Since the Patent and Trademark Office has already determined these claims 9-25 to be patentable to Zakoshansky, the Examiner should give full faith and credit to the earlier decision of the Patent and Trademark Office to issue the Zakoshansky patent and find claims 9-25 allowable to the present applicant. MPEP 704 and MPEP 706.04.

In the final rejection, the following is also stated:

> "Moreover, these claims are based on the same disclosure as the originally rejected claims and are read in the light of this disclosure. The claims of Zakoshansky are also read in the light of his disclosure which differs from the instant disclosure."

The meaning and significance of this statement is not understood. This statement should not be repeated or otherwise relied upon in the present application unless clarified.

The terms of the present claims 9-25 are regarded to be sufficiently clear as to not require reference to a specification for interpretation. MPEP 608.01. In the event that the position

expressed in the parent application is maintained in the present application, the Examiner is challenged to specifically point out, for each and every claim, the differences between applicants' disclosure and that of the Zakoshansky patent, which would render the subject matter of the present claims 9-25 patentable to Zakoshansky but not to the present applicants. The Examiner is requested to start with claim 15 of the present claims.

In the absence of such a showing, the Examiner should give full faith and credit to the earlier decision of the Patent and Trademark Office to issue the Zakoshansky patent and find claims 9-25 allowable to the present applicant. MPEP 704 and 706.04.

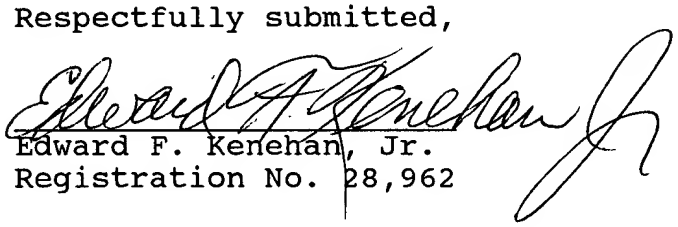
Accordingly, the rejection in the parent application under 35 USC 103 should not be repeated in the present application.

Allowance is requested.

MPEP 713.02 provides that an interview may be had in a continuing application prior to the first Office Action. Such an interview is requested.

The Examiner is invited to contact the undersigned at his Washington telephone number on any questions which might arise.

Respectfully submitted,



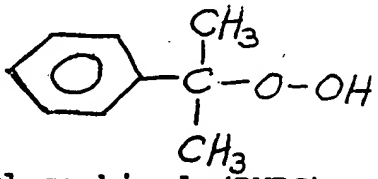
Edward F. Kenehan, Jr.
Registration No. 28,962

SUGHRUE, MION, ZINN,
MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3202
(202) 293-7060

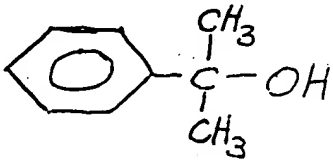
Date: May 2, 1996

CHEMICAL FORMULAE

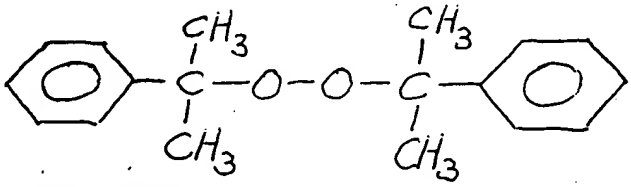
Cumene hydroperoxide (CHP)



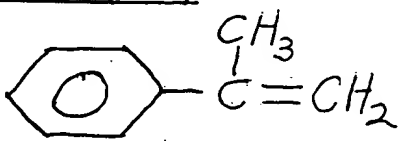
Dimethyl phenyl carbinol (DMPC) or Dimethyl benzyl alcohol (DMBC)



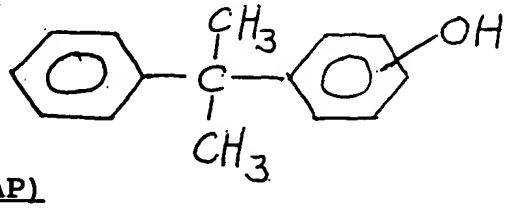
Dicumyl peroxide (DCP)



Alpha-methylstyrene (AMS)



Cumylphenol (CP)



Acetophenone (AP)